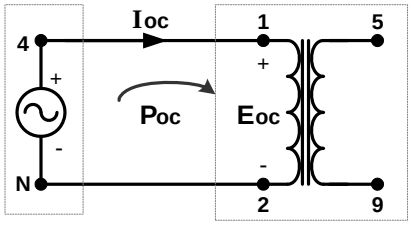
1. Transformer Ratings

Record the ratings for windings 1–2 and 5–9 of the transformer module.

2. Open-Circuit Test

Connect the following circuit, using winding 1–2 as the primary winding.



← Open-circuited secondary winding 5–9

Apply rated voltage, $\mathbf{E_{OC}}$, to the primary winding.

Measure $\mathbf{I_{OC}}$ and $\mathbf{P_{OC}}$, the open-circuit current and real power supplied to the primary winding.

Lower the supply voltage to zero and turn OFF the supply, but do not disassemble the circuit.

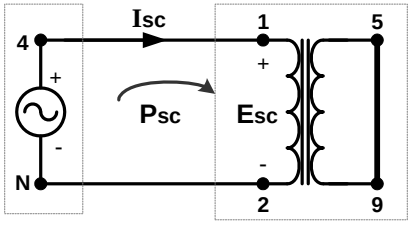
Report Guide – Open-Circuit Test (to be completed at home)

Use the results from the Open-Circuit Test to determine the value of the practical transformer model's core loss parameters $\mathbf{R_{fe}}$ and $\mathbf{X_m}$, referenced to the primary-winding (1–2).

3. Short-Circuit Test

Important Note – The short-circuit test is typically performed by supplying rated current to the primary winding of the transformer while the secondary winding is short-circuited. Due to the short-circuit conditions, this test only requires a small primary voltage.
******* Applying too large of a primary voltage may damage the transformer.*** ****

With the circuit still connected as required for the "open circuit test", place a "short" (jumper wire) across the secondary winding (5–9) of the transformer as shown in the following figure:



← Short-circuited secondary winding 5-9

Check to be sure that the supply voltage is set to **zero**, and then turn ON the supply.

Carefully increase the voltage until rated current, $\mathbf{I_{SC}}$, is applied to the primary winding.

Measure $\mathbf{E_{SC}}$ and $\mathbf{P_{SC}}$, the short-circuit voltage and real power supplied to the primary winding.

Lower the supply voltage to zero and then turn OFF the supply.

Remove the "short" (jumper wire) connected across the terminals of the secondary winding.

Report Guide – Short-Circuit Test (to be completed at home)

> Use the results from the Short-Circuit Test to determine the value of the practical transformer model's winding loss parameters**,** $\mathbf{R_{eq}}$ and $\mathbf{X_{eq}}$, referenced to the primary-winding (1–2).

Report Guide – Practical Transformer Model (to be completed at home)

> **Tabulate** (create a table that presents) the values of the impedance parameters for the practical transformer model as determined from the Open-Circuit and Short-Circuit tests.
>
> Provide an accurate **drawing** of the practical transformer model. **Label** all of the model's components with both their parameter names and their numerical values. Additionally, label all of the voltages and currents within the transformer model.

4. Load Tests

Connect a load **resistance** of **15Ω** to the secondary winding (5–9).

Adjust the supply to provide **rated voltage** (120V) to the primary winding (1–2).

Measure the values of the **primary current**, the **secondary voltage**, and the **secondary current** for the resistive load.

Replace the load resistor with an **inductor** that has a **reactance** of $\mathbf{X_L = 15\Omega}$ and repeat the measurements for the inductive load.

Replace the inductor with a **capacitor** that has a **reactance** of $\mathbf{X_C = 15\Omega}$ and repeat the measurements for the capacitive load.

Lower the supply voltage to zero and then turn OFF the supply.

Have the instructor <u>check your values</u> and then disassemble the entire circuit.

Report Guide – Load Calculations (to be completed at home)

> Using the practical transformer model that you developed in steps 1 and 2, **calculate** the expected **primary current**, **secondary voltage**, and **secondary current** if a the primary terminals are supplied at rated voltage and a **15Ω load resistor** is connected across the secondary terminals.
>
> Replace the resistive load with a 15Ω inductive reactance and repeat the calculations for the expected **primary current**, **secondary voltage**, and **secondary current**.
>
> Replace the inductive load with a 15Ω capacitive reactance and repeat the calculations for the expected **primary current**, **secondary voltage**, and **secondary current**.
>
> **Tabulate** the complete set of load calculation results.
>
> Numerically **compare** the calculated results for the three loads to those measured during the Load Test portion of the experiment.

1. Transformer Ratings

Transformer: _____ VA_{RATED}

Winding 1–2: _____ V_{RATED} _____ A_{RATED}

Winding 5–9: _____ V_{RATED} _____ A_{RATED}

2. Open-Circuit Test

E_{OC} = **120** V I_{OC} = _____ A P_{OC} = _____ W

3. Short-Circuit Test

E_{SC} = _____ V I_{SC} = **4** A P_{SC} = _____ W

4. Load Tests

Load	V_{PRI} (V)	V_{SEC} (V)	I_{PRI} (A)	I_{SEC} (A)
R = 15Ω	**120**			
X_L = 15Ω	**120**			
X_C = 15Ω	**120**			

Table 3.4 – Load Test Results

REPORT REQUIREMENTS:

For this experiment, you are required to submit an electronically-generated, "memo-style" lab report that contains no hand-written information.

See the "**Report Requirements**" section within the Lab 02 handout for detailed information regarding the general submission, formatting, and content requirements for this report.